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ABSTRACT

The second annual report of the 4-year Project CREATE describes activities toward the Project's overall objective of determining how effective microcomputer and related technologies can be in improving the education of learning disabled students. During the second year examination of factors understood to contribute to the beneficial use of technology for the handicapped was continued; a descriptive study of state and local leadership development in the area was completed; and a two-tiered software evaluation instrument was completed and field testing plans were developed. A major effort of the year was the detailed design and development of the TurboScan reading instruction and research system. The program incorporates automatic data collection on subject performance, easily variable software display and reinforcement characteristics. A report on the field test of the TurboScan program comprises a major portion of the document. Project plans for the third year include determining the types of benefits accruing to the learning disabled when particular design features are included in special purpose software. Appended are the Project objectives, a scope and sequence chart for TurboScan lessons, advertisements for other instructional software, and an information bulletin. (DB)

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CREATE

SECOND ANNUAL REPORT

December 1985

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Introduction

The overall goal of the CREATE to Learn project is to determine how effective microcomputer and related technologies can be in improving the education of the learning disabled. This goal has been pursued through studies and development efforts aimed at accomplishing six subordinate objectives (see Appendix A). The allocation of effort to each of these objectives has varied over the first two years, depending upon the project focus at each point in the four year R&D agenda.

Among the activities undertaken during the first project year were several key research review efforts which identified technology-based instructional design factors and areas of opportunity which offered a high probability of impacting on the current practice in educating the learning diabled. More specifically, the research evidence in the literature suggested that:

- microcomputer software was not being developed in such a way as to exploit the capabilities of the medium in educating the LD child, and relatively little was known about the kinds of instructional variables that most effectively enhance the use of computer software by special needs students.

- commercial software was being used "as is," with little adaptation or modification to strengthen the educational qualities that are potentially available in the program, and software supplements for the handicapped were virtually non-existent.

- synthesized summaries of the literature on these important computer-related matters were not generally available, indicating a need for selected occasional papers.

Activities conducted in the second project year continued the examination of a number of factors understood to contribute to the beneficial use of technology for the handicapped. Consistent with CREATE's Year 2 proposal, a descriptive study of SEA, IEA, and LEA leadership development was completed, resulting in a report entitled "Promoting Use of Technology in the Schools: An Organizational Analysis of California's Teacher Education and Computer Centers." A two-tier software evaluation instrument was also completed and plans for its test in the field are now in place. Additional information was also collected

on the logistics of using new technologies from the lab-schools with which we work. Significantly, the area of second year efforts to which most project resources were devoted and which holds the greatest promise for extending our knowledge of how to use microcomputer technology, was in the detailed design and development of the TurboScan reading instruction and research system. This system represents the combination of two software prototypes proposed for and developed during Year 2 (Hunt and Peck, and Pick-a-Pack... see Year 2 proposal for details). Additional features designed to facilitate the system's use for research were incorporated following productive conversations with Nancy Safer, the Project Officer, regarding the value and importance of conducting an integrated set of experimental research studies in our activities. These features primarily addressed the areas of automatic data collection on subject performance and the incorporation of easily variable software display and reinforcement characteristics. In moving toward this greater emphasis on experimentation, the CREATE agenda was modified to permit the conduct of two small studies at the elementary and secondary levels in the summer of 1985.

The development of an additional software prototype to enable experimentation in the area of information processing skills essential for efficient reading (Getting the Big Picture) was tentatively rescheduled for the summer of 1986. A final decision on the merits of this additional software development will be made during Year 3 in consultation with the SEP Project Officer.

Procedures and Accomplishments

Because of the emphasis on, and importance of the design, development, and research on the TurboScan system during Year 2 of CREATE, this detailed discussion of procedures and accomplishments will focus on TurboScan-related efforts. The design and development of this system occurred over an eight month period beginning in October of 1983, and involved the incorporation of design principles and instructional strategies from the research in Year 1, as well as substantive review by practitioners resulting in revisions and refinements. Field-based research using the system was conducted during the summer of 1984, when it was possible to schedule special summer classes at both the elementary and secondary levels. The analysis of study results which (reported below) occurred in August and September.

The TurboScan learning system. Written in FORTH for the Commodore 64K, TurboScan is a pre-reading instruction program that features training in those enabling skills which underlie higher-order comprehension. Practice in directionality, shape discrimination, component analysis, character rotation, inversion, and reversal, word identification and sight-word recognition, letter patterns and clusters, feature estimation, and word integrity are all available within the system through specially-designed screens and an array of screen-editor conventions. The screen editor, which allows nonprogrammers (e.g., researchers) to easily create new instructional presentations for learners, automatically adapts scoring and reinforcement routines to newly created screens and allows existing screens to be modified and tailored to individual learner needs.

One of the central features of TurboScan is a moving window, which runs left-to-right across either regular or oversized lines of characters. Speeds of the window can be preset or allowed to adapt to learner performance (e.g., moving more slowly if the number of errors increases). In addition to motivating learner attention and creating a sense of challenge (e.g., to see how fast I can go), this program feature builds scanning, or eye-tracking, skills, which can contribute to improved reading performance among disabled

students. In the summer studies described below, the importance of this window as an instructional device is evident. We should also note that The Learning Company has patterned one of their new reading products (still in development), after the TurboScan moving window. We are, of course, pleased to see this type of immediate impact of our work in shaping future software.

The design of TurboScan was based on the literature review and on the instructional and special education expertise of CREATE staff. In his paper entitled "Implications of Research and Theory for the Use of Computers with the Learning Disabled," CREATE Principal Investigator Dr. Robert A. Weisgerber outlined six areas of reading instruction to be explored by this program (these areas are summarized in Table 1). Many initial judgments as to specific program features, such as the reinforcers to be used or the design and the mode of interacting with the screen editor, were made based on staff experience concerning what makes software appealing and perceived as useful by intended audiences. In the case of TurboScan, the audiences to be satisfied included both learning-disabled students and their teachers. Dr. Rubin worked with Dr. Weisgerber and with special education teachers and resource personnel from CREATE lab school districts in making the key design decisions.

These decisions were preliminary, however, and the first round of TurboScan studies, which are described here, were aimed at testing their validity. Later studies, planned for the third grant year, will take a more summative approach to the conduct of TurboScan-related research.

Formative evaluation of TurboScan. The inherent flexibility of TurboScan made it possible to carry out formative evaluations of the effectiveness of different types of program features and varied screen content (i.e., lesson features) with students at both the elementary and secondary levels. To provide focus for these tests, letter and word reversal/inversion problems among elementary-age students and sight-word recognition and scanning-speed skills among secondary-age students were the instructional objectives of our summer studies.

Arrangements with the schools Since its inception, CREATE has worked closely with elementary and secondary schools in the Cupertino Union and Fremont Union

TABLE 1

Areas of Reading Instruction to be Explored by TurboScan

- Teach letter shapes by breaking them into curved and straight lines, emphasizing the angles, number of strokes, and directionality that are used (d b, p q); showing that neither the size of the letter nor the color changes the shape; teach letter pattern recognition to differentiate close but different words (hat, hate) to an automatic level; teach whole words as overall forms followed by the minimal confirmation of details that is necessary to establish word specificity (Chalfant & Scheffelin, 1969).

- With slow readers, emphasize whole word recognition rather than phonetic analysis (Chall reviewing Ansara et al, 1983).

- Develop a set of visual search tasks, one diagnostic and one remedial, such as "circling" a target letter in a field of letters (visual discrimination) or following a visual marker that moves progressively from the top to the bottom of the stimulus array (tracking) (McIntyre, 1981). A similar procedure could be used to locate specific words as is done when one is proofing.

- Teach the recognition of distinctive features in letter clusters (whether these occur at the beginning, the end, or centrally in words) by allowing students to "tack on" other letters to discover words that share these distinctive features (Miccanti, 1981). Words "earned" in this way could then be "saved in the bank."

- Build awareness of part-whole relationships (in both figural and verbal images) by using a moving "slot" through which various portions of the form can be displayed. The composite image will then be constructed by the viewer, combining "perception, apprehension, and imagination" skills (Badian, 1984). Variations could be tried where the slot "moves" or the concealed text "moves" with the size of the slot being variable.

- Build from single, stand-alone words to well spaced pairs of words, then three word sets, and eventually to horizontal lines. Others will assure that automaticity of word recognition precedes and transitions into the use of peripheral awareness to prescreen subsequent text, decreases the number of regressive eye fixations, and promotes contextual inference (Fisher, 1980).

School Districts, respectively. Teachers have been involved in the development of "idea-books" to accompany popular software products, and teachers and students have participated in small-scale trials of new software products. For the formative evaluation of TurboScan, CREATE staff arranged with school officials to operate special classes at both the elementary and secondary levels on a parallel schedule to the regular summer school programs.

At the elementary level, a multi-purpose room/library was the center of activity for eleven students, aged 7 to 12 years. A special education resource teacher from the district was engaged to assist with planning and to conduct daily activities in accordance with study objectives. She was assisted in these activities by a full-time aide. The period of the study was five weeks, with students divided into two ninety-minute sessions that met each morning. Students worked on computer tasks during (approximately) fifteen-minute sessions, which were interspersed with play and other non-computer instructional activities.

At the secondary level, a resource room was converted into an out-of-class study site for special education students. Twelve students, from among those enrolled in special education classes, were selected for participation in the study by summer school, special education teachers. These students came in pairs to the resource room for thirty-minute periods each day. Either TurboScan or an alternative microcomputer-based program, Comprehension Power, from Milliken, was assigned to each student. Students worked full-time on these programs during the period, save for the three-to-five minute breaks required for obtaining measurements from daily reading samples. The duration of this study was four weeks.

Selection and assignment of students. Student selection was based on teacher recommendations in both the elementary- and secondary-level studies. At the elementary level, teachers nominated students whom they believed exhibited signs of inversion/reversal problems. At the secondary level, teachers nominated students whom they believed could profit by practice at sight-word recognition and sentence scanning and could tolerate the required concentration on-task for the thirty minute period.

As originally planned, students at the elementary level were to be randomly assigned to the TurboScan treatment or to a control condition more typical of regular classroom activity (seat-work). This subject-assignment strategy was subsequently modified following administration of pretests and TurboScan diagnostic materials for reasons described below. At the secondary level, students were randomly assigned to the microcomputer-based treatments and paired so that, in each thirty-minute session, students worked on different programs (i.e., either TurboScan or Comprehension Power).

Pre/posttesting. A principal learning strategy for CREATE software products is that training in enabling skills (e.g., letter recognition by shape) should precede instruction at higher-level tasks (e.g., word recognition, sentence comprehension). One hypothesis related to this strategy is that improvements in enabling skills may remove barriers to mastery of higher-level cognitive skills. To the extent that these cognitive processing skills are intact, improvements in reading performance should occur. Thus, students exhibiting problems related to reading comprehension may find their difficulties ameliorated by concentrated training in an enabling-skill area.

Given this strategy for improving reading abilities, the pre- and posttests were selected to cover a broad range of enabling and higher-level skills. Students at both the elementary and secondary levels were assessed using the Eye-Trac apparatus*, which provides analyses of reading eye movements (e.g., reading rates, rates of regressions, and numbers of fixations), one-minute oral reading samples, and the Woodcock-Johnson reading comprehension test (Subtest #15). At the elementary level, students were also assessed using the Gardner and Jordan Reversal Tests, the Woodcock-Johnson test of word recognition (Subtest #13), and twenty-eight diagnostic screens presented by

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*The Eye-Trac was developed in the 1950s, with the present version of the instrument available in the late 1960s. The Eye-Trac, i.e., EDL/Biometrics Reading Eye II, is an infrared system that provides objective measures of the properties of the reading act. Used for the most part in optometric practice, this system is being used by CREATE for research into improving the reading-enabling skills of the learning disabled.

the TurboScan program. The use of one-minute oral reading samples was continued on a daily basis for both the elementary and secondary students to provide a continuous measure of performance.

For the elementary-level experiment broad-based pre/posttesting provided a check on the reading-related problems of students, as reported by teachers. This check proved to be valuable, and plans for the random assignment of these students to treatment versus control groups were changed based on pretest results that showed no apparent need for letter reversal training by some of the students.

Refinements of student groups and plans for lesson preparation. Of the eleven students participating in the elementary-level reversal/inversion study, five were found on the basis of the pretests to have little difficulties with either letter or word reversals or inversions. Discussions involving the special education resource teacher, CREATE staff, teachers of the children, and parents resulted in reorganization of the two study classrooms.

The morning session, consisting of five students, was devoted to reversal/inversion problems, and all of these students worked on TurboScan screens. Each child was treated as his or her own control, and performance over the study period was evaluated on a daily basis by comparison to previous performance levels. The afternoon session, made up of the remaining six students, specialized in reading comprehension and writing skills. These students did not use TurboScan software, instead they were presented with teacher-made materials and then usual classroom learning activities. For the purposes of the experiment, these afternoon students served as a "quasi-" control group, one that was older and more similar to the "regular" student population than to the morning group of experimental subjects. Moreover, this afternoon student group served, occasionally, as a "test-bed" for TurboScan innovations, further compromising their status as the classically pure group of control subjects.

It is worth iterating the point that CREATE viewed these summer studies as formative in nature, leading toward more effective TurboScan products which would then be ready for more summative investigations. For this reason,

evaluation of TurboScan effects was emphasized less than modification of TurboScan products to maximize learning during the course of the experiments. Given this perspective, it was natural to also view control groups as resources for product improvement, as well as sources of baseline data for comparison with treatment group gains.

Once pretesting of students was completed, student work on TurboScan materials and on associated learning tasks (e.g., Comprehension Power materials) commenced. In addition to the classroom teachers and aides, at least one CREATE staff person was always present at the study sites during implementation. Both the teachers and project staff were involved in creating and refining TurboScan screens, observing on-task student behaviors, keeping and monitoring student performance records, and obtaining daily, one-minute reading samples from each of the study participants.

Creating and refining TurboScan screens. The TurboScan screen editor allows programmers as well as nonprogrammers to develop lesson screens with ease, once a small set of editing conventions is learned. This ease of use permitted teachers and aides, in addition to CREATE staff persons, to develop lesson screens for study participants.

The approach followed for the summer studies involved two levels of screen creation. First, senior CREATE staff and advisors developed screens based on CREATE instructional design philosophies and according to an instructional sequence chart that had been established by CREATE with consultation from district teachers. Appendix B presents this scope and sequence chart for TurboScan-based lessons. Second, teachers, aides, and CREATE staff who observed students daily adapted existing screens and created variants of types of screens in accordance with perceived needs of individual students.

As screens were developed in either of these ways, they were organized into instructional sets tailored to the needs of each student. The contents of each student's designated set of screens were printed out prior to use of the screens in the classroom, to facilitate recording of required refinements (e.g., to improve the clarity of the instruction line, to reduce the number of "targets" or response stimuli). Critical reviews of each screen, based upon

observations of student performance, were made by CREATE staff and by instructional staff. Revisions in these screens and the creation of new screens for specific tasks, such as "smoothing" the transition from one type of learning objective to another, were made by these reviewers.

Gathering observations. At both the elementary and secondary levels, observations of on-task student behaviors were valuable for refining planned software-based lessons. For elementary students, observation provided important clues to identifying overly difficult instructional tasks--those that demanded too much from the student or those whose instructional objectives were not clear to the student-user. The wandering of attention, too-quick starting of the moving window, idle key-pressing (with resulting window slow-downs) all indicated some deficiency in screen presentation or some special student problem.

As these signs were noted, instructional or CREATE staff would approach the student and talk informally about the task. In some cases, one of these staff persons would accompany the student to a "break" activity (e.g., beginning a computer game, reading aloud as part of the daily monitoring of reading rates). The information obtained from these interactions was used, together with computer-generated records of student performance, in critically reviewing the content and format of each of the lesson screens presented on a given day. Since a limited number of screens were repeated from one day to the next (to provide continuity and to promote mastery of specific skills) revisions could be made to "troublesome" screens and the results of these revisions could be tested with the same students.

At the secondary level, observations were important as gauges of (1) appropriateness of screen difficulty levels (e.g., complexity of tasks presented, speed of the TurboScan window) and (2) effectiveness of the ordering of tasks (e.g., numbers of consecutive screens covering similar skills, distribution of "fun" screens among subject-specific exercises). Slouching postures and wandering eyes usually signalled the needs for greater challenge or for some personal encouragement. New ideas for TurboScan materials were introduced freely into the secondary school experiment, and student performance on day-to-day refinements of the software were used in determining most effective screen designs.

Student recordkeeping. At both the elementary and secondary levels, TurboScan was relied upon to keep screen-by-screen records of student progress on task (i.e., screens attempted, errors made, window passes needed, window speeds achieved). In addition, at both these levels, daily reading rates were recorded on specially-printed forms, and, at the secondary level, progress on Comprehension Power (e.g., words-per-minute reading speeds, retries, comprehension scores) was recorded on specially-made forms.

An anecdotal record was kept by CREATE staff on each student-participant, with entries based upon personal observations or on discussions of teacher-made observations. Each day, at the end of the study session, the teachers at both levels met with CREATE staff to discuss student progress and to discuss, design, and create new lesson screens. In some cases, modifications were made to existing screens during these sessions, after reviews of student performance records. At the elementary level, where mastery of reversal/inversion problems was the focus, these daily discussions and decisions about existing and new screens led directly to the planning of each student's program, including screen repetitions until acceptable levels of performance were achieved.

Obtaining daily reading rates. At the outset of the studies, it was decided that daily measures of performance in reading should be obtained for all student-participants. Rather than rely solely on teacher judgments, students were asked to read aloud each day and their reading rates (i.e., numbers of words read in one minute minus numbers of errors) were recorded. The procedures followed included: (a) student selection of books from available school collections (books with many pictures were avoided, as were books with very small or unusual print-faces), (b) trial of the selections made to establish reading-level appropriateness, and (c) daily "warm-ups" at the beginning of the timed reading periods to acclimate students to the task. Although day-to-day variability in reading speed is to be expected, repeated measures of reading speed provide reasonably stable indicators of progress achieved (e.g., by identifying variability due to irrelevant factors, such as fatigue). To minimize scorer effects on reading rates, teachers, aides and CREATE staff alternated the students they tested, once scoring procedures had been established (e.g., length of the "warm-up" period was standardized,

stop-watches were employed). Interrater reliabilities were continuously evaluated as student scores were reviewed on a daily basis and discussed by the raters.

Findings of summer TurboScan studies. TurboScan, like any instructional software, is as effective a teacher as the instructional designs that are developed to take advantage of program capabilities. Having available a planned sequence of TurboScan lessons (i.e., the scope and sequence chart presented in Appendix B) was of the greatest importance in conducting the summer studies. This sequence facilitated the preparation of screens, the evaluation of student performance on various sets of screens, and judgments as to appropriate learning paths for students exhibiting different levels of proficiency.

Instructional outcomes attributable to TurboScan lessons were of two types: (1) extent of student attention-to-task, which for many disabled students can be a serious problem for learning, and (2) extent of student mastery of enabling skills for reading, which was measured directly (e.g., by tests of these skills) and indirectly (e.g., through assessments of higher-order comprehension skills). The indirect measurements of student performance proved not to be illuminating, since the duration of the experiments was too short for gains in comprehension to be noticed in either of the control or the experimental (i.e., TurboScan) groups. For this reason, student gains in task-attention and enabling-skill development, as measured directly, are the principal discussion points of this section.

Student gains in task-attention. Prior to the start of the elementary and secondary studies, CREATE staff planned to structure computer-based instruction into 15-minute modules, to be broken up by play or group activity (at the elementary level) or by the taking of reading rate samples (at the secondary level). It was felt that this approach would be best for maintaining high levels of motivation.

Students at the elementary level who worked with TurboScan, as well as those in the control group who experimented with the word processing package "OmniWriter," often became involved in their computer work and opted to delay

a play or other group activity for several minutes or more. Moreover, some of these students elected play activities that were themselves computer-based, thereby reducing the "change-of-pace" effect that had been anticipated for these recreational sessions.

Students rarely exhibited boredom, and they never asked to be excused from computer-related activity. Quite the contrary, these secondary students often arrived at the CREATE "lab" several minutes early, began work immediately, set personal goals for themselves (see the discussion below), and worked on tasks with full concentration. One visually-impaired student, who had been excused from the study following the pretest but who asked to be allowed to participate, attended each day, worked the full thirty minutes on Comprehension Power, and read aloud for speed with the special education teacher, her aide, or with the attending CREATE staff person.

At the secondary level, students fell easily into the habit of applying themselves to the task at hand, without prompting, as soon as they came to the resource room. Students who arrived earlier than expected would either take up a vacant computer or stand behind students who were completing their day's work. Reading-rate samples were taken at times decided upon by the resource teacher, who would call for individual students when it seemed they had reached a natural "breaking point" (e.g., completion of a TurboScan screen). On several occasions, a student working on his or her computer would ask the teacher to delay the reading-rate sample ("Just let me finish this one...").

The factors most affecting student task-attentiveness were (1) strength of teacher "support" for the activity and (2) perceived "reasonableness" of the challenge presented by the program. In both studies, students were well aware that the sessions were "special." Computers were set up for them to use, teachers, teacher aides, and "other" adult staff were there to help and to encourage--often on a one-to-one basis. At the elementary level, students would lose interest or begin to make errors as their attention wandered, usually when the program material seemed too difficult. At the secondary level, students wanted to be challenged, and program material that was too easy (or too "slow") was a distinct "turn-off." Both TurboScan and Comprehension Power, which were used at the secondary level, provided

appropriate challenges for students through pre-set presentation speeds and difficulties of the materials presented. The attentiveness of both the elementary and secondary students participating in these formative studies was observable through their postures (e.g., sitting up straight versus slouching down in their chairs) and their demonstrations (e.g., expressing themselves out-loud).

The combination of engaging computer software and readily available teacher support was most effective in initiating and maintaining student on-task interest. Because teachers were monitoring student efforts and were able to recognize and respond to student problems, there were few incidents of students wanting to "do something else." Similarly, TurboScan, and at the secondary level Comprehension Power, were constantly monitoring student efforts and presenting lesson materials that were challenging. In the tradition of behavior modification techniques, which have been proven to work effectively with various special student populations, these monitoring and teaching devices were effective in promoting optimal conditions for learning among the special students involved in these CREATE studies.

Student gains in enabling skills. Character and word reversal and inversion skills were the focus of TurboScan presentations at the elementary level. Students at this level who worked with the program had difficulties distinguishing correct from backwards "d's" for example, and they confused words such as "saw" and "was." Sight-word recognition was the primary emphasis at the secondary level. The students fell into two groups--those who lacked the discrimination skills or perceptual attentiveness necessary to consistently identify particular letters or words and those who lacked the confidence to identify a word (e.g., in text) without several rereadings.

Decreases in inversion/reversal rates. Table 2 (top) compares the mean pre-/posttest scores of elementary-level students on the Gardner Test of Reversals and Inversions. Those students in the TurboScan (experimental) group, who had lower scores on the pretest than did students in the control group, are shown to have reduced their error rates on the average by more than twice the level of the control group during the period of the study. Figure 1 displays pre- and posttest scores of selected elementary-level, Turbo-Scan students on this test.

TABLE 2

Reversal/Inversion Errors and TurboScan Results

STUDY 1. ELEMENTARY LEVEL

GROUP/TREATMENT A - (TURBO SCAN) - LEARNERS WHO MOST NEEDED REVERSAL/INVERSION PRACTICE

GROUP/TREATMENT B - - LEARNERS WHO DIDN'T NEED ADDITIONAL REVERSAL/INVERSION PRACTICE

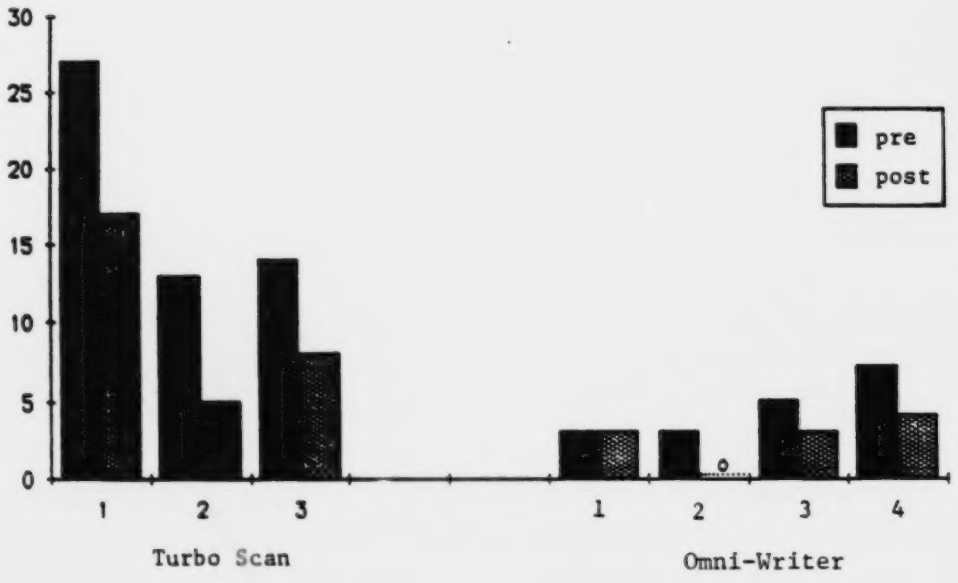
N : A = 5
B = 5

AGES 10 and 11

RESULTS

DISCRIMINATION ABILITY	GARDNER/JORDAN REVERSAL/INVERSION ERRORS		
	$\bar{x}$ pre	$\bar{x}$ post	$\bar{x}$ change
GROUP A	16	11	-5
GROUP B	5	3	-2

AUTOMATICITY	TURBOSCAN DIAGNOSTIC SERIES (correct:incorrect) scanning speed	
	y pre	2y post
GROUP A	3.4 : 1	3.4 : 1
GROUP B	5.2 : 1	3.5 : 1



Elementary - Inversion and Reversal Intervention

FIGURE 1. Inversion/reversal errors for selected students as measured by the Gardner Reversal Frequency Test

Table 2 (bottom) compares the ratios of correct to incorrect responses on TurboScan reversal/inversion screens made by experimental and control students at this level. These results indicate that experimental subjects maintained consistent levels of performance on the average when the window speeds for these screens were increased by a factor of two. Control subjects, who began with higher levels of proficiency in working with these test screens, were not able, similarly, to maintain their levels of performance when screen speeds were increased. In fact, the performance of experimental and control groups on this posttest was virtually the same.

Increases in reading rates. Table 3 compares pre-/posttest reading rates of experimental (TurboScan) and control (Comprehension Power) subjects at the secondary level. The mean change for both groups was about the same, strongly positive, suggesting that either of the software treatments (coupled with the taking of daily reading samples and accompanying teacher encouragement) is capable of building this performance skill. The comparison of mean percentage growth for the two groups, however, which reflects the lower starting points of the experimental subjects, suggests the (differential) importance of the gains made by the experimental students. Figure 2 displays pre-/posttest reading rates for selected individual students in the TurboScan and Comprehension Power treatments.

Eye-Trac changes. Figures 3 and 4 present examples of pre/post Eye-Trac readings for elementary and secondary treatment group participants, respectively. In both cases, the smoothing of eye movement patterns, from many regressions (shown as forward-and-backward movements of the eyes) to a step-like pattern of fixation and continuation proceeding steadily left-to-right, reflects reductions both in the incidence of regressions and in the average duration of fixations while reading.

Table 4 compares individual performances of treatment and control subjects on four measures provided by the Eye-Trac apparatus: the number of regressions per 100 words (REG), the average duration of fixations (FIX), relative efficiency--the ratio of reading rate with comprehension to the sum of fixations and regressions (R.E.), and directional attack--the ratio of

TABLE 3

Mean Pre/Post Reading Rates

STUDY 2. SECONDARY LEVEL

GROUP/TREATMENT A - (TURBO SCAN) - RANDOM ASSIGNMENT TO TREATMENT - PRACTICE SIGHT WORD RECOGNITION

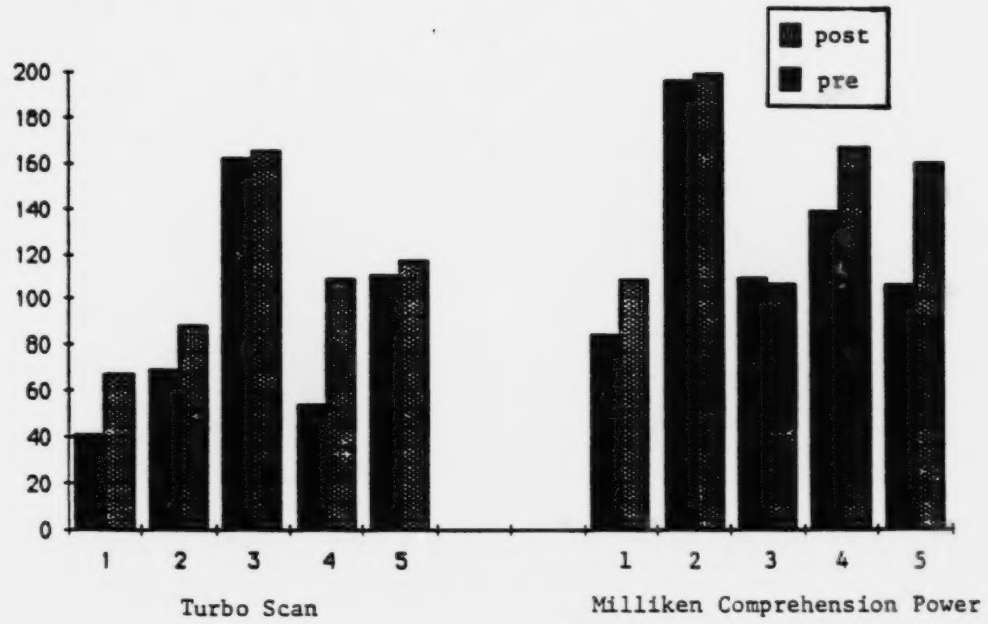
GROUP/TREATMENT B - (MILLIKEN COMPREHENSION POWER) - RANDOM ASSIGNMENT TO TREATMENT - PRACTICE READING SPEED AND COMPREHENSION

N : A = 5
B = 5

AGES 15 to 18

RESULTS

	$\bar{x}$ pre	$\bar{x}$ post	$\bar{x}$ change	$\bar{x}$ % growth
GROUP A	87	109	22	25%
GROUP B	127	148	21	17%



Secondary - Sight Word Recognition / Reading Rate Intervention

FIGURE 2. Reading rates (words/minute) for selected students

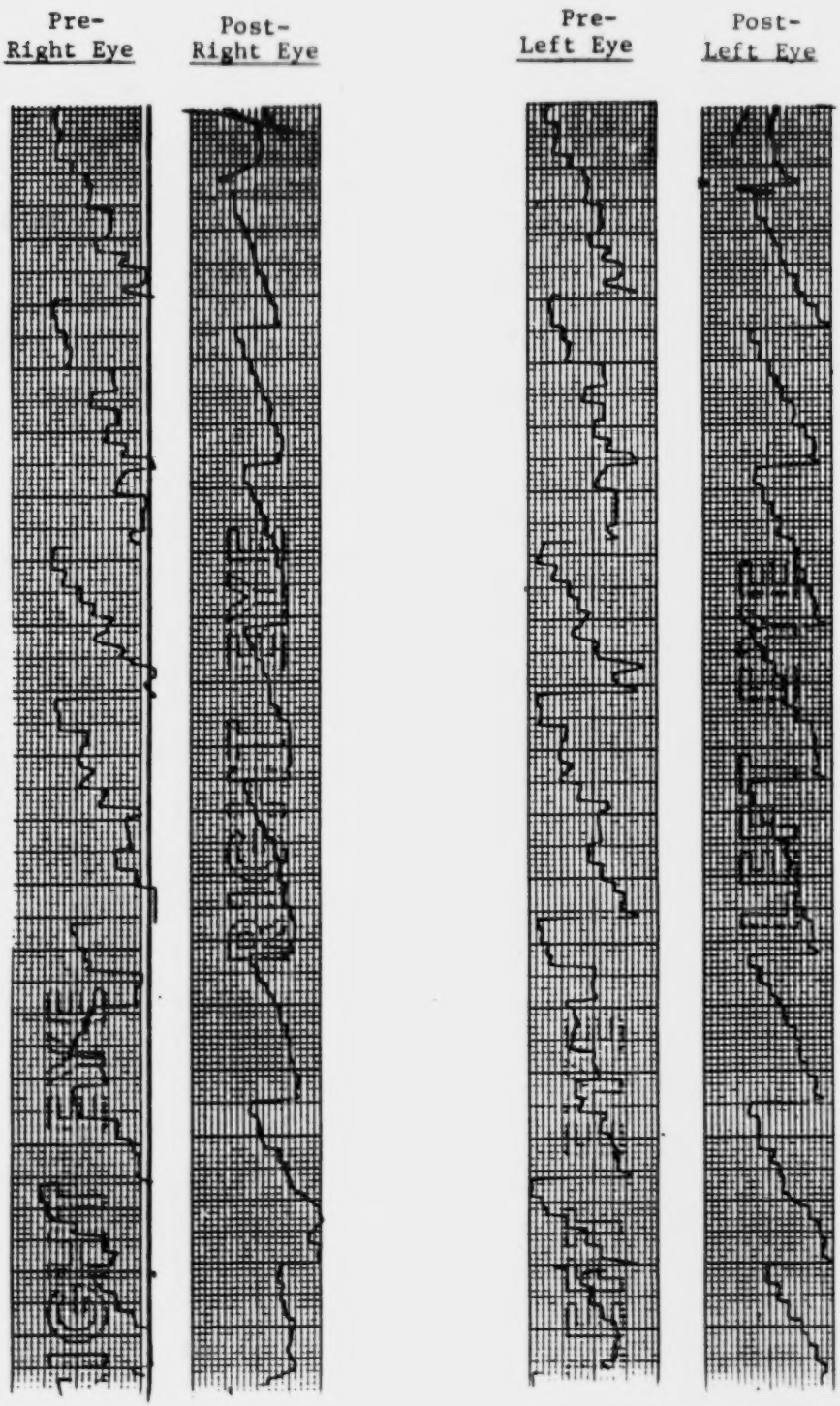


FIGURE 3. Pre/post comparison of Eye-Trac results for TurboScan user, elementary level

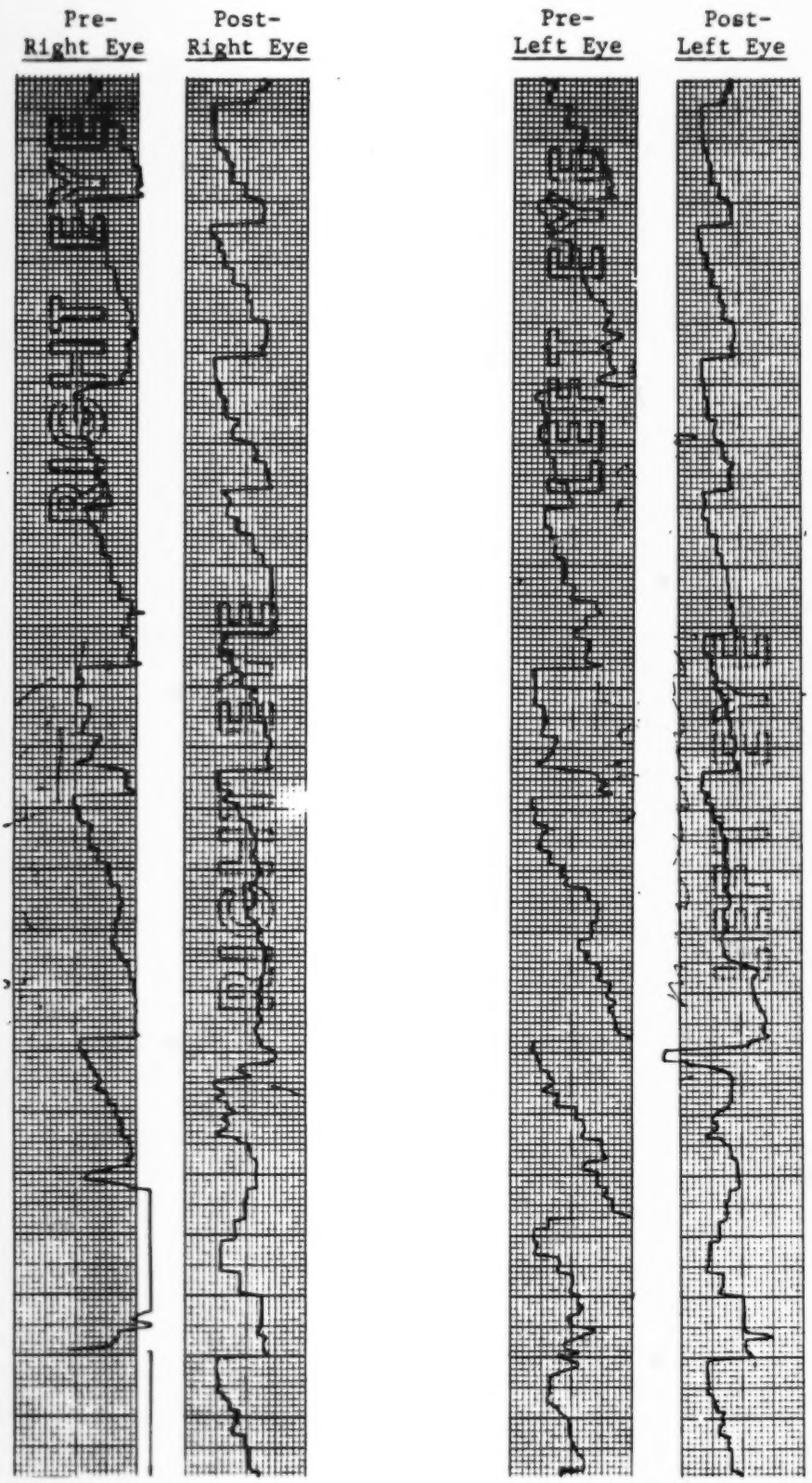


FIGURE 4. Pre/post comparison of Eye-Trac results for TurboScan user, secondary level

TABLE 4

Individual Scores for Treatment and Control Group Subjects on Selected Eye-Trac Measures of Reading Performance

		Pretest				Posttest				Summary*			
		REG	FIX	R.E.	D.A.	REG	FIX	R.E.	D.A.	REG	FIX	R.E.	D.A.
Elementary	TurboScan	34	.30	.64	21	18	.27	1.48	16	*	*	*	*
		48	.49	.22	23	60	.56	.22	31				
		50	.37	.57	26	42	.52	.42	29	*			
		82	.72	.008	28	56	1.65	.09	31	*		*	
	Omni-Writer	76	.34	.19	32	34	.46	.32	18	*		*	*
		96	.24	.43	48	52	.32	.63	35	*		*	*
		21	.37	.87	16	16	.32	1.65	16	*	*	*	
		20	.37	1.21	19	17	.37	3.23	25	*		*	
		48	.31	.47	26	32	.35	.54	20	*		*	*

		REG	FIX	R.E.	D.A.	REG	FIX	R.E.	D.A.	REG	FIX	R.E.	D.A.
Secondary	TurboScan	51	1.49	.20	44	39	1.15	.28	30	*	*	*	*
		22	.44	.58	15	14	.50	.80	12	*			*
		21	.30	1.70	21	11	.30	2.75	15	*		*	*
	Milliken	21	.32	1.12	18	23	.37	1.08	21				
		32	.53	.31	18	27	.40	.62	19	*	*	*	
		24	.36	.70	17	19	.36	.92	15	*		*	*
		6	.39	2.62	8	4	.29	2.89	5	*	*	*	*

* Summary asterisks indicate that pre/post changes were in the directions suggesting improvements in performance.

regressions to fixations (D.A.). For the first, second, and fourth of these measures, changes indicating improvement in performance would be from larger to smaller numbers (e.g., reduced numbers of regressions, shorter fixations on the average, and fewer regressions as a percentage of total fixations). For the third measure, relative efficiency, improvement is indicated by the move from smaller to larger numbers (increase in reading rate with comprehension relative to the total fixations and regressions).

Asterisks on this table indicate positive changes from pre- to posttest for each individual. For certain individuals, these changes in the positive direction are striking. Overall, both treatment and control group subjects, both using age-appropriate computer software, showed improvements on these measures. This would appear to suggest that computer-based reading may have a beneficial effect on patterns of eye movement in general.

Findings and Assessment of Second Year Effort

Sharpened focus on field-based research

During the second year of the CREATE project, a shift in emphasis occurred away from software prototype development and toward field-based experimentation that will address two central research questions:

1. Can microcomputers/particular software be used to teach/improve the learning performance of learning disabled students with particular characteristics?

2. What features are critical in software for learning disabled students with particular characteristics?

This shift and sharpened focus on the above two questions resulted from the availability of the TurboScan system, which now permits the conduct of a number of controlled experiments to explore these questions, and the advise and encouragement of SEP staff.

Software Supplementation

One of the initial CREATE activities involved the supplementation of widely used educational software so that it would be more accessible by the learning disabled. The idea for these activities stemmed from a view of the installed base of school software and hardware as an underutilized resource. We reasoned that a primary barrier to better utilization was the difficulty that learning disabled students and teachers encountered when trying to incorporate popular educational software into regular programs of instruction. We felt that a number of these difficulties (e.g. prerequisite prior knowledge, lack of clearly stated objectives related to student's instructional needs) could be removed through the use of appropriately designed supplementary print materials.

Through field-based development involving more than 10 teachers of the

learning disabled, working with selected educational software and with their students, five model software "idea books" were produced. We are pleased to report here that during the second project period contracts were signed for the publication of two of these handbooks by major school software publishers, The Learning Company and Sunburst (see Appendix C for samples of their promotional materials). We are optimistic about the likelihood of commercial publication of the remaining handbooks.

In our initial proposal for CREATE we expressed the view that "a research and development effort that identifies effective technology-based instructional strategies and demonstrates their use in a variety of school settings will impress publishers with the broader marketability of special education computer materials." The publication of the software handbooks are clear indicatations that project efforts along these lines have been valuable.

Dissemination Activities

We have actively continued to disseminate information about project objectives, activities and findings during the second project year. In table 5 we list articles, presentations, and position papers that were the products of Year 2 dissemination activities. In addition, we distributed a copy of REACH Bulletin #2 (see Appendix D) used to inform some 200 interested parties about the progress of CREATE as well as other AIR Special Education research efforts. These publications and activities have been immediately useful in stimulating requests for voluntary participation in field testing of CREATE products. We hope that the dissemination activities will have longer term payoffs as well, as school staff and other special educational professionals who receive information from us put into practice methods and materials which we have found to be useful.

TABLE 5

CREATE YEAR 2 PRODUCTS AND PRESENTATIONS

Articles

Rubin, D., & Weisgerber, R. (1985). The center for research and evaluation in the application of technology to education. T.H.E. Journal, 83-87.

Weisgerber, R., & Rubin, D. (1985). Designing and using software for the learning disabled. Journal of Reading, Writing, and Learning Disabilities, 133-138.

Presentations

November, 1984	Oakland, California Council for Exceptional Children (CEC) Conference
February, 1985 (ACLD)	San Francisco, California Association for Children & Adults with Learning Disabilities (ACLD) International Conference
March, 1985	Sacramento, California Transition Grant Meeting, California State Department of Education
April, 1985	Anaheim, California CEC 63rd Annual Convention

State-of-the-art Position Papers

CREATE Monograph Series, 1984

Rubin, D., Blake, P., & Aten-Iossi, B. The learning disabled and computer based education: Program design strategies.

Weisgerber, R., & Blake, P. The evaluation and selection of instructional software for use with the learning disabled.

Weisgerber, R. Implications of research and theory for the use of computers with the learning disabled.

Bakke, T. Existing and emerging technologies in education: A descriptive overview.

Bakke, T. Optimal approaches to microcomputer implementation in the schools.

Conclusions

With the completion of the second year of the CREATE project we are at an important juncture in our overall research and development agenda. We have built carefully upon the foundations of instructional strategies and principles derived from Year 1 reviews of research. In doing so we have created prototypes of software and software supplements which we believe will effect the use of technology in special education through commercial channels. We have conducted formative research to optimize the software prototypes and develop a system that will permit important research on instructional variables affecting the learning disabled child's reading skills. We are hopeful that in our next annual report we will be able to specify the types of benefits that can accrue to the learning disabled when particular design features are included in special purpose software. TurboScan will allow us the flexibilty needed to conduct these experimental studies.

APPENDIX A

APPENDIX A
CREATE OBJECTIVES

1) To demonstrate how microcomputers can be used effectively to develop handicapped learners' enabling skills and processing skills as preconditions to their development of performance skills.

2) To identify general principles of instructional design for microcomputer materials, focusing on such variables as learner-sensitive pacing, screen display characteristics, auditory presentation of information, visual-motor response generation, and reinforcement techniques.

3) To learn how to manage the logistics and leadership training involved in effectively integrating new technologies into existing educational programs for the handicapped.

4) To develop methods of evaluating, selecting, and adapting existing materials in order to make them suitable for the learning disabled.

5) To identify and describe innovative applications of new technologies in varying contexts that can lead to "breakthroughs" for handicapped learners.

6) To determine the extent to which networks and interactive systems can be used for the pooling of resources, student information, and instructional content thus extending access to these new technologies and increasing their cost-effectiveness.

APPENDIX B

APPENDIX B

Scope and Sequence Chart for TurboScan Lessons

Enabling Skill A

To identify the attributes of symbols and characters that differentiate them from each other, and to make rapid discriminations between shapes that are similar.

Level 1. Recognize and differentiate forms based on gross characteristics.

Concepts: Distinguish straight, curved; open, closed; large, small; diagonal, vertical, horizontal.

Example: lC; o c; O o; / l -

Level 2. Recognize and differentiate forms based on directionality and laterality.

Concepts: Distinguish top, bottom; left, right; up, down.

Example:

Level 3. Discriminate features based on component analysis.

Concepts: Less than, more than; part of, all of; same, opposite.

Example: n, m; F E; R P; p b

Enabling Skill B

To distinguish particular symbols or characters, and patterns of symbols or characters, when presented in a background field of distractors.

Level 1. Perceive the form and position of a symbol or character in order to compare it to a specific target.

Concept: Relative shape and position on a horizontal line.

Example:

Level 2. Perceive the form and position of a character in order to compare it to a target character in a particular orientation.

Concept: Maintain relative orientation of significant feature.

Example: b bpb ddp pdb dbp

Level 3. Perceive a set of characters as a unit within the field.

Concept: Maintain form constancy regardless of field position.

Example: ch change reach cheap catch

Enabling Skill C

To distinguish selected features of words that contribute to sight recognition (initial, character, word shape, and word length).

Level 1: Recognize initial and ending letter combinations.

Concept: Quickly classify words by their beginnings.

Example: Beginning wh--Where were those when I wanted them?

Level 2: Recognize the ascender and descender patterns of particular words.

Concept: Quickly classify words by the presence or absence of ascenders and descenders in character sets.

Example: Ending ght

I was right to hold tight

Level 3: Distinguish the relative lengths of words.

Concept: Differentiate words based on perceived length.

Example: Find three letter words

___ You and I went to the store.

Enabling Skill D

To recognize particular combinations of characters as being meaningful.

Level 1: Distinguish sets of characters that constitute a target word when presented within a field of words.

Concept: Identify specific words by sight.

Example: Find through

Go through the door and then through the hallway.
Be sure to call when you are through.

Level 2: Distinguish acceptable and unacceptable letter patterns within a field.

Concept: Proofread for errors.

Example: He siad that was OK, dut she said it was not.

Level 3: Apply visual memory to silent and oral reading.

Concept: Combine word beginnings and endings appropriately.

Example: Find and say the words that start with ex.
__periment __peg __plain __tra

Cognitive Skill E

To read rapidly with comprehension.

Level 1: State words rapidly based on word characteristics (initial character, word shape, word length)

Concept: Perceive the length of the word and read it aloud.

Example: Read any 3 letter word: The boy and his dog went home.

Level 2: Recognize that word meaning and context are related.

Concept: Anticipate words based on context.

Example: The bruise on my leg turned black and _ _ _ _.
bang blue best bone

Level 3: State words at a rapid rate and understand their meaning.

Concept: Read rapidly for meaning.

Example: The game is played with eleven players. Each one has a special role. The goal keeper stops the other team from scoring.

A. The team scores with a goal keeper.
B. The goal keeper has a special role.
C. The game has eleven goal keepers.

APPENDIX C

APPLE VERSION WORKS WITH TOUCH WINDOW™ (See page 21.)

THE FACTORY™

Strategies in Problem Solving

AWARD WINNER ②⑤⑥⑦⑧

Grade level: 4-adult

Designed by: Marge Kosel and Mike Fish

● RECOMMENDED FOR PURCHASE IN *Electronic Learning, Family Computing, InfoWorld, Parents' Choice, Scientific American, Teaching and Computers*

Using color graphics and animation, this unique three-level program challenges students to create geometric "products" on a simulated machine assembly line that they design. Students develop inductive thinking and integrate their skills in visual discrimination, spatial perception, understanding sequence, logic and efficiency.

The program focuses on several problem-solving strategies, including working backward, analyzing a process, determining sequence and applying creativity.

Teaching Objectives:
1. To develop inductive reasoning skills.
2. To show students the importance of sequence.

Contents of each package: one diskette, backup, teacher's guide.

NEW! Apple II+, IIe, IIc: 48K
Compatible with Touch Window.
No. 1129-CF $59
No. 1351-CF: Computer Lab Pkg. $177

Atari 400, 800, XL Series: 16K
No. 1064-CF $59
No. 1352-CF: Computer Lab Pkg. $177

Commodore 64
No. 1130-CF $59
No. 1353-CF: Computer Lab Pkg. $177

IBM PC: 64K, IBM PCjr: 128K
Color graphics card and color monitor required.
No. 1231-CF $59
No. 1354-CF: Computer Lab Pkg. $177

NEW! Tandy 1000: 256K
No. 1487-CF $59
No. 148710-CF: Computer Lab Pkg. ... $177

TRS-80 Color Computer: 32K
No. 1096-CF $59
No. 1355-CF: Computer Lab Pkg. $177

NEW!
FIRST TIME OFFERED!

THE FACTORY WORKBOOK

A Teacher's Aid to The Factory

Grade level: 4-adult

Designed by: American Institute for Research, Palo Alto, CA

The Factory Workbook is a 200-page book of activities, worksheets and games designed for use with Sunburst's problem-solving program, **The Factory**. Especially appropriate for use in special education classes, **The Factory Workbook** can help special learners make the transition to working with the computer. In addition to instructing the student on how to use **The Factory**, the exercises in the workbook increase the student's attention span, improve symbol/pattern recognition skills, and develop abstract reasoning.

The Factory Workbook provides reproducible, step-by-step worksheets that familiarize students with the keyboard and the commands used in the program through role-playing, vocabulary/picture flashcards and program screen sheets. Special students can learn each skill at their own pace!

Compatible with all versions of The Factory!
No. 1541-CF: 200-Page Booklet $25

FREE! ON 30-DAY LOAN!
Teacher Training Videotape on The Factory

This videotape is an actual classroom demonstration of *The Factory*, designed to aid instructors in formulating a problem-solving curriculum. This useful videotape is **FREE—on 30 day loan.**

The videotape offers innovative ideas on how to present *The Factory* to your whole class.

To receive your videotape **on 30-day loan,** simply check the box provided on the enclosed order form when you place your order, and we'll rush your videotape to you right away. And you can make all the copies you like!

Ask for The Factory Videotape!
(PLEASE SPECIFY VHS, BETA I OR BETA II)

NEW!

THE SUPER FACTORY

Grade level: 6-adult

Designed by: Mike Fish and Marge Kosel

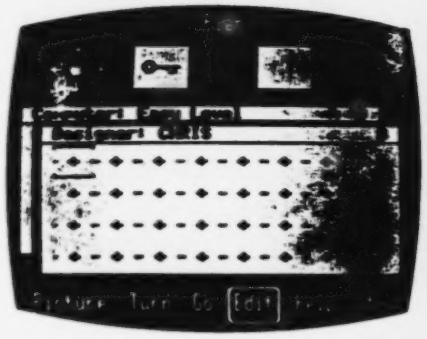
Imagine seeing a cube with pictures on its faces and imagine that you can rotate and look at the cube. . .could you then duplicate the cube? Both the natural world and the world created by technology abound with three-dimensional, geometric forms. Yet we do very little to teach students about spatial geometry. **The Super Factory** is a unique new way to help you bridge that gap.

From the planning stages to the final product, with **The Super Factory**, your students are in control. They are taught problem-solving strategies as they research and design products and challenge each other. Different levels of difficulty encourage students to attain new heights in logical thinking. If you and your students liked **The Factory**, you'll love **The Super Factory**.

Teaching Objectives:
1. To encourage visual reasoning and thinking in three dimensions.
2. To reinforce the problem-solving concepts of analyzing a sequence and working backward.

Contents of package: one diskette, backup, teacher's guide.

Apple IIe, IIc: 64K
No. 1409-CF $59
No. 140910-CF: Computer Lab Pkg. ... $177



Remember, you get the Sunburst 100% Guarantee of Satisfaction! If, for any reason, you are not completely satisfied with any program you purchase from Sunburst, simply return it for a full refund.

For a definitive guide to the use of *The Learning Company* software with Learning-Disabled children, by Miriam Furst, author and Special Education consultant, send 4.95 including postage and handling to:

Item number TM204
The Learning Company
545 Middlefield Rd., Suite 170
Menlo Park, CA 94025

Classroom Materials for Teachers and Educators from *The Learning Company*

- **Special Lab Pack Offer to Educators** — This is the offer that educators have been waiting for. Educators may purchase additional copies of *The Learning Company* software in five-pack sets for only $60 per set plus a $3.00 handling charge. Order directly from *The Learning Company* by writing to us on your educational letterhead. Original program warranty card must accompany each order. **Item number TM206***
- **Teacher Guides and Student Activities** — Designed with Addison-Wesley Educational Textbook Publishing. Integrates *The Learning Company* programs into the classroom. Activities for use both with and without the computers with easily reproducible black-line masters provide lots of hands-on action for all the students in the class. **Item number TM200***
- **Scope and Sequence Charts** — These charts help educators understand how the above Guides and Activities work with the formal curriculum. **Item number TM201***
- **Reader Rabbit: New Teacher Guide and Student Materials** — These materials show how to adapt this leading new reading readiness program to the classroom. **Item number TM202***
- **Rocky's Boots Science Materials** — Follow step-by-step directions to produce working models of basic circuits using materials commonly available in home or classroom. Easy to use and classroom tested. **Item number TM203***
- **Robot Odyssey I in the Classroom** — The first in a series of materials to tailor this highly acclaimed program to classroom use. Included are learning objectives and evaluation tools to introduce the foundation concepts to the entire class. **Item number TM205***

** Please list item number for each item of interest.*

Call or write for free information on these items to: Classroom Materials Division, *The Learning Company.*

QUALITY GUARANTEED... OR YOUR MONEY BACK!

Ninety-seven percent (97%) of those who try a program from *The Learning Company* tell us they plan to buy others. We are proud of this reputation and back-up each of our programs with the following offer:

30-DAY MONEY-BACK OFFER

If for any reason you are not completely satisfied with any product from *The Learning Company*, we will gladly exchange it for another *Learning Company* title or refund your purchase price. Simply return the program and package to us, along with your receipt showing the store name and location, within thirty days of the date of purchase. Also enclose a statement as to why you are returning it and whether you would like a replacement. *(Note: Limit of one per household. Dealers, wholesalers and their immediate families are not eligible.)*

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APPENDIX D

APPENDIX D

REACH BULLETIN #2

October 1984

EXPANDING OUR EFFORTS IN SPECIAL EDUCATION

Readers of our first bulletin will note that we have changed its name. The new title is the REACH Bulletin (Research and Educational Applications Center for the Handicapped). The happy occasion for this change is the expansion of our research and development efforts through two new grants from the Special Education Programs Office of the U.S. Department of Education. In addition to our ongoing examination of how to effectively use computer technology to improve the education of learning disabled youth (through the CREATE project), October marks the beginning of:

- LD Vision - a one-year study to evaluate computerized vision training equipment for the reading disabled, and
- TEAM Work - a three-year project to develop a model school-to-work transition program for the handicapped, which stresses training in social skills.

REACH bulletins will permit us to report on each of these projects. We will aim to keep readers informed about project plans, progress and products, as well as their practical implications for special education.

CREATE

State-of-the-Art Papers - Six papers have been written by CREATE staff during the first project year. These have served the primary purpose of bringing our future research and development plans into clear focus. They also provide a way to share our views with others in the special education community. The following papers are now available from REACH:

1. Existing and emerging technologies in education: A descriptive overview. ($11.75 + .76 tax for CA purchasers)
2. Implications of research and theory for the use of computers with the learning disabled. ($13.00 + .84 tax for CA purchasers)
3. The learning disabled and computer-based education: Program design strategies. ($11.50 + .75 tax for CA purchasers)
4. Evaluation and selection of instructional software for use with the learning disabled. ($12.50 + .81 tax for CA purchasers)

5. Optimal approaches to microcomputer implementation in the schools. ($12.00 + .78 tax for CA purchasers))
6. Promoting use of technology in the schools: An organizational analysis of California's teacher education and computer centers ($11.00, + .72 tax for CA purchasers)

If you are interested in any of these papers please send a request on letterhead to AIR's Publication Department. Be sure to enclose a check for each paper you would like. (This amount covers the costs of duplication, handling, and postage.)

Hunt and Peck - This software prototype, being developed by CREATE staff, will be ready for testing in our laboratory schools during late fall or early winter. Intended to help students with reading disabilities, the current design includes the following components:

- Symbol, character and number discrimination - building shape discrimination skills and remediating tendencies for inversion and reversal;
- Word recognition and discrimination - building skills in visual perception of word shapes with ascenders, descenders, common initial and ending letter clusters, and phrases and compound words;
- Line oriented text decoding - building skills in proofing and scanning, identification of topic sentences, and reading for speed and comprehension.

Pre-set instructional content will enable students to begin work at a suitable level for their skills, and then to enhance their ability through a progression of increasingly more challenging exercises. Flexibility in setting the rate of presentation and the visual display characteristics, and interest generating scoring are just some of the distinctive features included. The software will also include a teacher authoring/editing capability permitting the creation of individually tailored instructional materials. Special editing symbols entered from the keyboard will cause the computer to automatically invert, reverse and highlight whatever textual instructional targets students need extra practice on. Discussions we have had with major educational publishers regarding the eventual marketing of Hunt & Peck have been quite encouraging.

Supplementary Software Documentation - A significant obstacle impeding the effective use of microcomputer technology with the learning disabled has been the difficulty school personnel encounter when they attempt to integrate commercially available software into the regular curriculum. It should be easier for teachers to prepare students to sit down at a computer, load a program, and have a productive educational experience. Instructions presented as part of the software are often unclear or difficult for students (as well as teachers) to understand. Moreover, relating the instructional content of software to the scope and sequence of instruction in a student's classroom often takes a substantial amount of planning by teachers.

CREATE staff, with special education staff of the Cupertino Union School District and Fremont Union School District, have been developing supplemental

curriculum materials to demonstrate one way to address this problem. Six pieces of widely available educational software have been selected for adaptation. These are:

1. Word Spinner - The Learning Company
2. Reader Rabbit - The Learning Company
3. Magic Spells - The Learning Company
4. The Factory - Sunburst
5. Kidwriter - Spinnaker
6. Story Machine - Spinnaker
7. Elementary, My Dear Apple: Darts - Apple Computer, Inc.

For each of these programs, staff are developing from five to ten "activity modules". Each module has three parts: (1) classroom instructional activities to prepare students for use of the program, (2) a computer activity which specifies how the program should be used for a particular instructional objective, and (3) post-computer activities to help students transfer what they have learned to regular class work or tasks outside of the classroom. Each activity module includes easy-to-construct manipulatives, or "seat-work" in the form of reproducible masters, or group activities so that skills or knowledge that will be needed for effective use of the software can be practiced in advance and easily in the classroom.

Each module provides a straightforward step-by-step approach to computer use. Hopefully, teachers who have never used computers in their instruction will be able to take advantage of computer hardware and software that may already be in their schools but which they have not known how to use effectively.

LD-VISION

In preparing one of the CREATE state-of-the-art papers, staff reviewed research on vision that indicated that neuro-muscular dysfuntions may underly the reading difficulties of many of the students identified as reading disabled in schools. Moreover, research on the effectiveness of corrective training that has been conducted by optometrists has shown that these neuro-muscular problems are often correctable, and when corrected can result in significant increases in attention and longer "comfortable" reading periods.

The implication that this visual therapy for the reading disabled might be an effective yet unused remedial treatment prompted our submission of a proposal to the U.S. Department of Education to evaluate computer-based approaches to providing this remediation. If such approaches are effective, they will help students who are poor readers or who tire of reading quickly because of poor binocular (stereo) vision at near (reading) distances. These students may well have had eye tests and passed them. Traditional eye tests measure acuity, not binocular vision. Thus, many reading disabled youngsters may be misdiagnosed and receive remedial reading instruction at a cognitive level which fails to address their underlying vision problem.

Our year-long evaluation will test the effectiveness of a new computer training device produced by CATT Incorporated. If our hypothesis about its effectiveness is correct, it will make appropriate testing and remediation possible and affordable in school settings.

The project will be directed by Dr. David Grisham, a leading researcher in the relationship between reading and vision. He is currently on the staff of the University of California's School of Optometry at Berkeley, and will soon begin a joint appointment at AIR.

TEAM WORK

In a policy statement entitled "Bridges from School to Working Life" (1984), Madeleine Will cited statistics for the Bureau of the Census, the U.S. Commission on Civil Rights, the U.S. Department of Labor, and the White House Working Group on Disability Policy to show that:

- Approximately 8 percent of the gross national product is spent each year on disability programs, most of which is used to support dependence.
- Between 50 and 80 percent of working-age disabled adults are unemployed and community service programs are overcrowded.
- Costs for day and vocational services are rising, yet persons involved in non-competitive work often experience low wages, slow movement toward employment, and segregation from non-handicapped peers.

Ms. Will also shared her optimism that "disabled people can work, want to work, can live independently, [and] should live independently." Our agreement with this point of view, and our conviction that much can be done to help the disabled to move from school into the work place, led to our TEAM Work proposal (Training, Education, and Abilities Model for Work).

Our project will have an emphasis on social skills training. We will develop social skills guidebooks for use by those service providers, trainers and supervisors with transition responsibilities. There will be three main stages in our approach, each requiring approximately a project year to complete:

- Year 1 - Priority needs will be determined in businesses, transition agencies, and schools. Guidebooks will be developed based on these priorities.
- Year 2 - The new Guidebooks will be tested at field test sites and a Replication Manual will be developed to help those who wish to start new Team Work programs.
- Year 3 - Dissemination and training activities will be undertaken to share information about the Team Work approach and to expand the model to selected states and sites.

* *

For further information, or to explore ways in which your organization might benefit from participation in REACH projects, contact:

David P. Rubin, Director CREATE; Principal Investigator, LD Vision
Robert A. Weisgerber, Director REACH; Principal Investigator, TEAM Work